

# PATENT ABSTRACTS OF JAPAN

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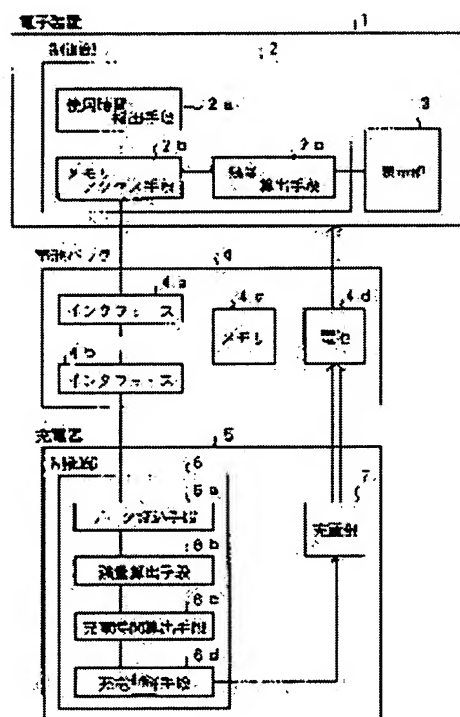
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## (54) CHARGING SYSTEM FOR BATTERY PACK

### (57)Abstract:

**PURPOSE:** To prevent overcharging and over discharging so as to improve safety by including a memory in a battery pack and providing interfaces for a charging device and an electronic device such as a wireless device.

**CONSTITUTION:** A memory 4c is provided in a battery pack 4, while interfaces 4a, 4b for an electronic device 1 and a charging device 5 are arranged, and a time of battery use in the electronic device 1 is counted. The counted value is transferred to the pack 4, and consumption of the battery 4a is stored in the memory 4c. In charging, data in the memory 4c is read out by means of the charging device 5, and a charging time in the charging device 5 is computed, and then, charging is carried out. In other words, when an electric power source is turned on to the electronic device 1 so as to start the action of the electronic device 1, a using time of the electronic device 1 is detected by means of a using time detecting means 2a so as to be transferred and written into the memory 4c via the interface 4a in the pack 4 by means of a memory access means 2b. On the basis of this data, residual capacity of the battery is found via the memory access means 2b, a residual capacity computing means 2c, and the like so as to be displayed in an indicating unit 3, so that overcharging and over discharging can be prevented.



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CLAIMS

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[Claim(s)]

[Claim 1]In a charging system of a battery pack connected with an electronic device disengageable, have a hour-of-use detection means to detect a hour of use of the electronic device concerned to a control section of said electronic device, and a memory access means to a memory of a battery pack, and to said battery pack A memory and said electronic device. And have an interface which performs data transfer between battery chargers, and a control section of said electronic device hour-of-use data detected by said hour-of-use detection means by said memory access means. Store in a memory of said battery pack and a control section of a battery charger, A charging system of a battery pack, wherein it will compute charging time by reading data of said memory and computing a residue of a cell from read data if connected with said battery pack for charge, and only this charging time charges to a cell of said battery pack.

[Claim 2]In claim 1, equip said battery charger with charge and a discharge function, and a control section of said battery charger, If battery residue is computed by reading data of said memory, time to discharge this battery residue will be computed, A charging system of a battery pack only this calculating time's performing discharge from a cell by said discharge function, computing charging time as what does not have battery residue after a discharge end, and charging it to a cell by said charging function.

[Claim 3]A charging system of a battery pack forming a walkie-talkie as said electronic device, providing a control section of said walkie-talkie with each counting means of transmitting processing time of a walkie-talkie, reception time, and waiting processing time in claim 1 or 2, and storing each processing time in said memory.

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## DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention relates to the charging system of the battery pack used with an electronic device. In recent years, it came to be used as a power supply of electronic devices, such as a walkie-talkie of a portable form which uses the battery pack provided with the rechargeable battery which can be charged. If cell capacity falls according to use of an electronic device, it is necessary to charge such a battery pack with a battery charger but, and to perform proper charge to a cell is desired.

[0002]

[Description of the Prior Art]Drawing 5 is an explanatory view of a conventional example. As for a primary detecting element and 53, in drawing 5, a walkie-talkie and 51 are [ a battery pack and 55 ] battery chargers an indicator and 54 a wireless circuit and 52 50. When it is carried in a car etc. and separates from a car in the state where it was connected with the battery pack 54, the walkie-talkie 50 is removed from a fixing place, and is used as a carried type walkie-talkie. The primary detecting element 52 of the walkie-talkie 50 detects the pressure value of the cell supplied from the battery pack 54, and displays a pressure value by the indicator 53 as a residue of a cell. If the residue of this battery pack 54 falls in constant value, the battery charger 55 will be equipped with the battery pack 54 which was united with the walkie-talkie 50, and charge will be performed. Regardless of the residue of a cell, fixed time execution of the charging time in this case is carried out.

[0003]

[Problem(s) to be Solved by the Invention]When electronic devices, such as a walkie-talkie linked to the cell of a battery pack, are used according to the conventional example, see a residue, and are performing charge by a battery charger suitably, but. Since it is not charging by detecting the remaining exact cell capacity corresponding to the amount of the cell used, there is a problem of becoming a surcharge and affecting the life of a cell.

[0004]When operation of charging after it discharged depending on the rechargeable battery and the residue has remained is repeated and is performed, there is character (it is called a memory effect) in which a cell deteriorates and cell capacity falls. In that case, although degradation could be prevented by charging after making a cell once discharge, even if judging whether it is necessary to make it discharge discharged by being difficult, whether discharge was completed and since it was not able to grasp, it might become overdischarge.

[0005]

[Means for Solving the Problem]Drawing 1 is a principle lineblock diagram of this invention. in drawing 1 -- 1 -- electronic devices, such as a walkie-talkie, and 2 -- a control section and 2a -- a hour-of-use detection means and 2b -- as for a memory access means and 2c, both directions with a battery pack a battery pack and 4a an indicator and 4 for a residue calculating means and 3, as for a bidirectional interface with an electronic device, and 4b, [ and ] 4c -- a memory and 4 d -- a cell

and 5 -- as for a charging control means and 7, a control section and 6a of a residue calculating means and 6c are [ a data reading means and 6b ] live parts a battery charger and 6. [ of a charging time calculating means and 6 d ]

[0006]This invention provides a memory in a battery pack, and form an interface to an electronic device and a battery charger, and if time which uses a cell with an electronic device is counted, the value will be transmitted to a battery pack, The amount of cell used is memorized by memory, data of a memory measure is read by a battery charger at the time of charge, and it charges by computing charging time in a battery charger.

[0007]

[Function]If a power supply is supplied to the electronic device 1 of drawing 1 and an electronic device starts operation, the hour of use (hour of use of a cell) of an electronic device will be detected in the hour-of-use detection means 2a. The detected value is transmitted to the memory 4c via the interface 4a of the battery pack 4 with memory access means 2b, and is written in. If a power supply is switched on to the electronic device 1 next, the data of a hour of use stored in this memory 4c is read with memory access means 2b of the control section 2, the residue calculating means 2c will be supplied, the residue of a cell will be calculated, and it will be displayed on the indicator 3, and will tell a user about a residue.

[0008]When the electronic device 1 is used next without charging after using it last time, and there are many residues of a cell, the electronic device 1 is used as it is. In this case, this processing time is detected by the hour-of-use detection means 2a, and that counted value is also written in the memory 4c of the battery pack 4 by the same operation as the above.

[0009]When the residue of a cell decreases, the battery pack 4 (the electronic device 1 and one may be sufficient) is connected with the battery charger 5. At this time, the data reading means 6a performs read in of data via the interface 4b of the battery pack 4 in the control section 6 of the battery charger 5. When the data which expresses the hour of use of a cell by this is obtained, the residue of a cell from the data by the residue calculating means 6b. It computes and the charging time for next performing a full charge to a residue is computed by the charging time calculating means 6c, and the computed charging time is supplied to the charging control means 6d, and controls the live part 7 by the charging control means 6d. At the time of a charge end, the data of the hour of use stored in the memory 4c of the battery pack 4 is reset. At this time, the data showing having charged the memory 4c can be written in.

[0010]Although the principle composition in the case of charging to a cell was shown in the composition of drawing 1, in order to prevent degradation of the cell by the memory effect of a cell, a discharge function is given to the battery charger 5 and it controls as follows. Namely, when the counted value of charging frequency is stored in the memory 4c of the battery pack 4 with the battery charger 5 and the battery pack 4 is connected to the battery charger 5 at the time of charge, with the data of processing time from the memory 4c of the battery pack 4. When the counted value of charging frequency is read and the counted value reaches fixed numbers, the time line corresponding to the residue of a cell should just control discharge of a cell first to charge after that. When the counted value of charging frequency does not become fixed numbers, counted value is updated and it stores in the memory 4c of the battery pack 4.

[0011]

[Example]Drawing 2 is a lineblock diagram of an example. This example is an example applied to the walkie-talkie as an example of an electronic device (1 of drawing 1).

[0012]In drawing 2, the wireless section [ according / 20 / to a walkie-talkie ] which performs transmission and reception according [ 22 ] to radio according [ 21 ] to an antenna, the control section in which 23 contains CPU and a memory, and 24 connect with an indicator, and 25 connects with a battery pack. EEPROM the interface part which performs a data transfer, and 26 memorize a battery pack, and 27 remembers the amount of the cell used to be (Erectorically Erasable Programmable ROM), When the interface part which 28 is connected with the walkie-talkie 20 and

accesses EEPROM27 by control from the walkie-talkie 20, and 29 are connected with a battery charger, the interface part which accesses EEPROM27 by control from a battery charger, and 30 are cells. The control section which the interface part by which 31 is connected with a battery charger and 32 is connected with a battery pack, and 33 are provided with CPU and a memory (a program and data), and controls charge (and discharge) of the live part 34, and 34 are live parts. The live part 34 uses the circuit which prepares a discharge function for the case where control which performs discharge so that it may mention later in control of charge is performed.

[0013]Drawing 3 is a process flow in the control section of a walkie-talkie, A. is a main routine and B. is interruption handling routine. The walkie-talkie 20 is in the state connected to the battery pack, is used in the state where it was separated from the battery charger 31, and distinguishes the existence of powering on first in the main routine of A. (S1 of drawing 3). This distinction is performed by identifying the state of turning on and off of an electric power switch (not shown). If a power supply is switched on, the control section 23 will read the data showing the amount of the cell used memorized by EEPROM27 via the interface part 25 and the interface part 28 of the battery pack 26 (said S2), will detect battery residue from the amount of the cell used by calculation, and will display it on the indicator 24 (said S3).

[0014]The interruption handling routine shown in B. of drawing 3 is started by every fixed time (time shorter than 1 second in this example) after powering on, and it is distinguished whether transmitting processing is performed first (S4 of drawing 3). Distinguishing whether 1 second passage was carried out, if it is transmitting processing (said S5) in the case of 1 second passage, the counter (provided in the memory of the control section 23) of transmitting processing time is counted up (+1) (said S6), and it carries out data transfer of the processing time to a battery pack (said S7). When it is not transmitting processing, it distinguishes in reception (said S8), if it is reception, it will distinguish whether 1 second passage was carried out (the S9), and if it has passed, a reception counter will be counted up (said S10) and the data communications of the processing time will be carried out to the battery pack 26. When it corresponds to neither transmitting processing nor reception, it distinguishes in 1 second passage (said S11), when it passes, a waiting time counter is counted up (said S12), and data transfer of the processing time is carried out to a battery pack. When 1 second passage of neither of transmitting processing, reception, and waiting of the cases has been carried out, interrupt processing is ended, the time progress from last time is measured according to each processing at the time of the next interrupt processing, and it distinguishes in 1 second passage.

[0015]If it transmits and receives and the processing time (it corresponds to the hour of use in the composition of above-mentioned drawing 1) of each processing to await is transmitted to the battery pack 26 from the control section 23 of the walkie-talkie 20 by processing of B. of drawing 3. Each data by which the interface part 28 was transmitted to EEPROM27 of the battery pack 26 by control of the control section 23 at that time is written in. Also where the walkie-talkie 20 is turned [ a power supply ] OFF, when EEPROM27 of the battery pack 26 has memorized data and then the power supply of the walkie-talkie 20 is made one, by the main routine of A. of drawing 3. The control section 23 reads the data showing the amount used memorized by EEPROM27 of the battery pack, and detects and displays battery residue.

[0016]When a user wants to charge by battery residue decreasing etc., the battery pack 26 (or battery pack 26 which combined the walkie-talkie 20) is connected to the battery charger 31. Control of charge is started by the control section 33 of the battery charger 31 at this time.

[0017]Drawing 4 is a process flow in a battery charger. If a battery pack is inserted in a battery charger, data will be read from a battery pack (S1 of drawing 4). In this case, it is data showing the processing time written in the read data by processing of above-mentioned drawing 3. Next, the sum total of a hour of use is searched for from the data of this processing time, and battery residue is computed by subtracting from the capacity (available time) of a cell (S2 of drawing 4).

[0018]Next, it is distinguished whether a discharge function is used (said S3). When the battery

charger 31 is equipped only with the charging function, it is not necessary to provide this step, and it shifts to the following step S4 promptly from the above S2. Since it has used the cell for fitness for a long time in equipping the battery charger 31 with a discharge function, Discharge can be specified from the exterior that it discharges since the characteristic it is better to discharge before charge is maintainable with a switch etc., and it can be specified to charge in a hurry that it does not perform discharge.

[0019]When not using a discharge function, or when there is no discharge function in a battery charger, charging time calculation is operated (the S4). It can ask for this calculation based on battery residue. When charging time is computed, charging treatment is made to start from the control section 33 to the live part 34 (said S5). Then, when 1 minute passes or it supervised and (said S6) passes, the counted value of cell capacity (residue) is made to raise (said S7), data transfer of counted value is performed to the battery pack 26, and it memorizes to EEPROM27 (said S8). Next, a charge end or distinction of (whether to have become the computed charging time) is carried out (the S9). If it returns to Step S6 and charging time is reached when not ending, charge will be ended, the data (data of a processing time count) of a battery pack will be reset (said S10), charge end time is transmitted (said S11), and it stores in EEPROM27 of a battery pack.

[0020]In the above-mentioned step S3, if it is judged that a discharge function is used, a charging time value will be computed (said S12). A charging time value is proportional to the battery residue calculated at the above-mentioned step S2, and is acquired by carrying out the multiplication of the constant decided beforehand. Next, electrodischarge treatment is made to start from the control section 33 to the live part (henceforth charge and a discharge section) 34 (said S13). Then, whether 1 minute of discharge passed, and when it distinguished and (said S14) passes, the down of cell capacity is counted (said S15) and data transfer of the value is carried out to a battery pack (said S16). Next, it is distinguished whether it becomes the charging time value found beforehand, and discharge is terminated (said S17). When not ending, it returns to Step S14, and when it ends, discharge operation is suspended, it shifts to the above-mentioned step S4, and the control action of charge is started. In this case, as for a charge, battery residue is performed as 0.

[0021]Although battery data is reset and the data of the processing time of EEPROM27 is reset in Step 10 after the charge end of above-mentioned drawing 4, the history of charging frequency is recordable by writing charging frequency in EEPROM27 of the battery pack 26 next. In judgment (S3 of drawing 4) of the above-mentioned discharge function, this charging frequency can discharge, only when charging frequency becomes more than fixed.

[0022]

[Effect of the Invention]In this invention, a memory is built in a battery pack and it has an interface with electronic devices, such as a battery charger and a walkie-talkie.

Therefore, the state of the cell currently used becomes possible [ recognizing also from a battery charger ] also from a walkie-talkie.

By using this battery pack, prevention of overcharge and overdischarge is attained and a battery charger with high safety can be constituted.

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1]It is a principle lineblock diagram of this invention.

[Drawing 2]It is a lineblock diagram of an example.

[Drawing 3]It is a figure showing the process flow in the control section of a walkie-talkie.

[Drawing 4]It is a figure showing the process flow in a battery charger.

[Drawing 5]It is an explanatory view of a conventional example.

[Description of Notations]

1 Electronic device

2 Control section

2a Hour-of-use detection means

2b Memory access means

2c Residue calculating means

3 Indicator

4 Battery pack

4a, 4b interface

4c Memory

4 d Cell

5 Battery charger

6 Control section

6a Data reading means

6b Residue calculating means

6c Charging time calculating means

6 d Charging control means

7 Live part

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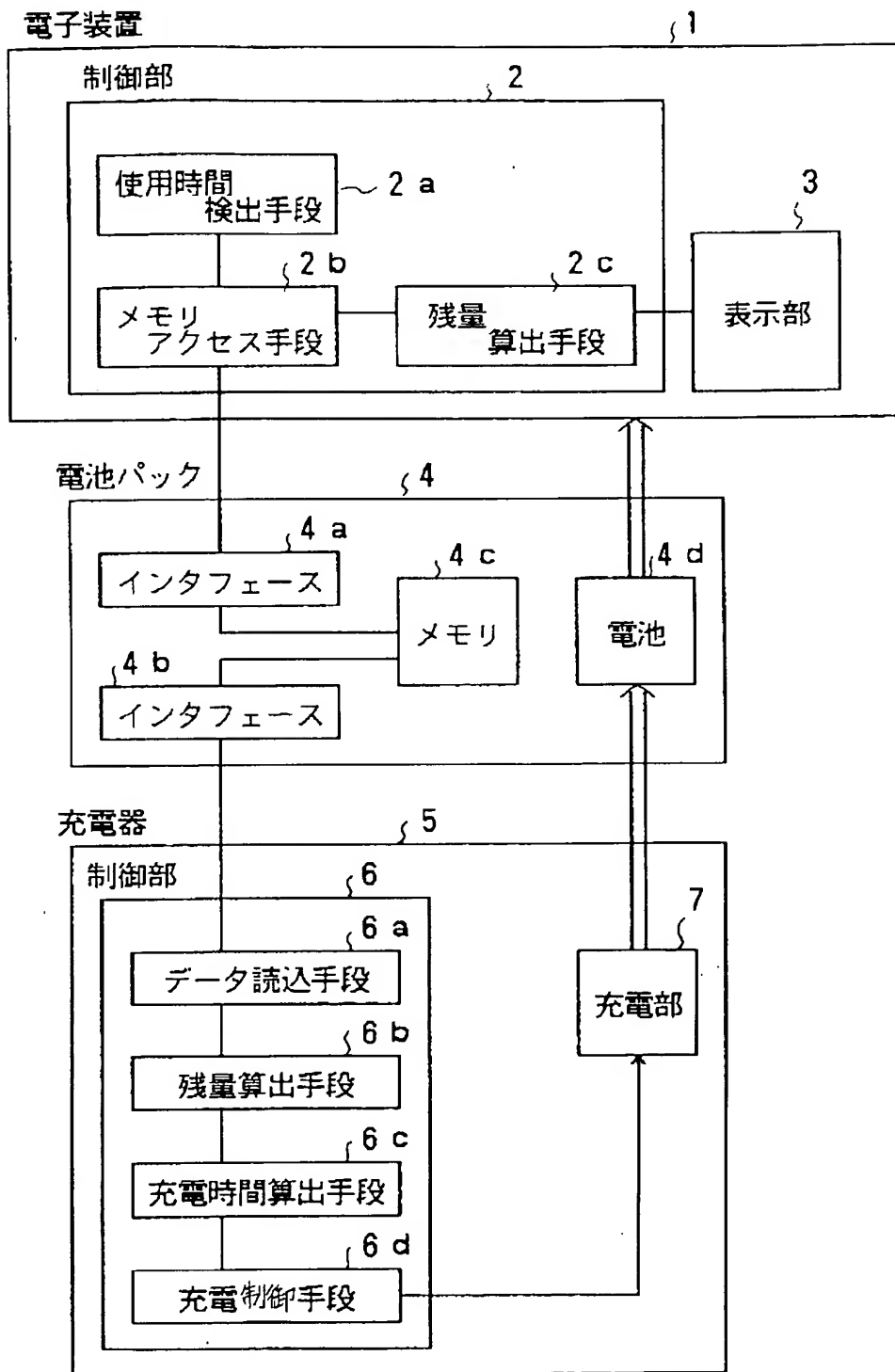
DRAWINGS

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[Drawing 1]

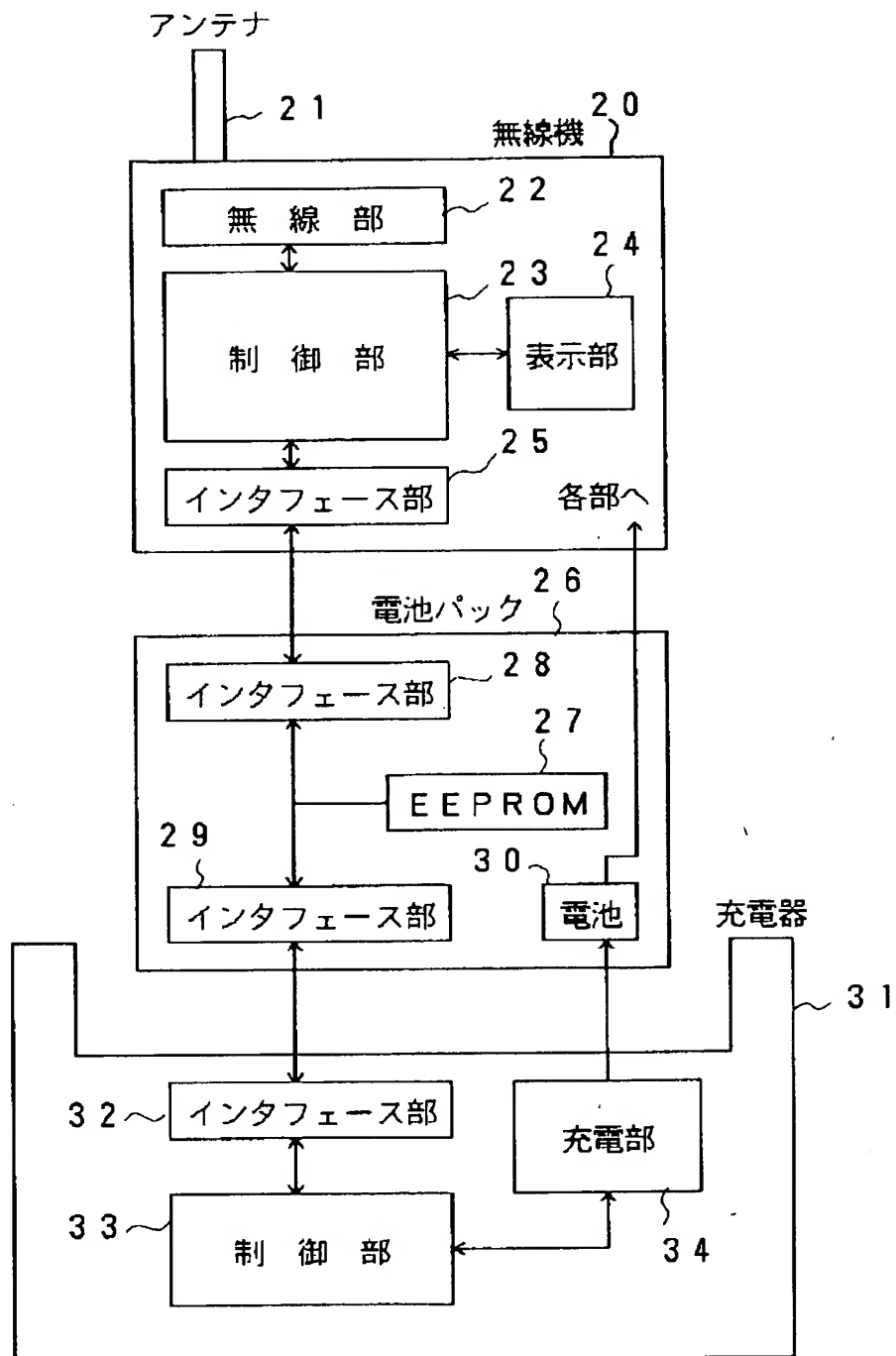


## 本発明の原理構成図

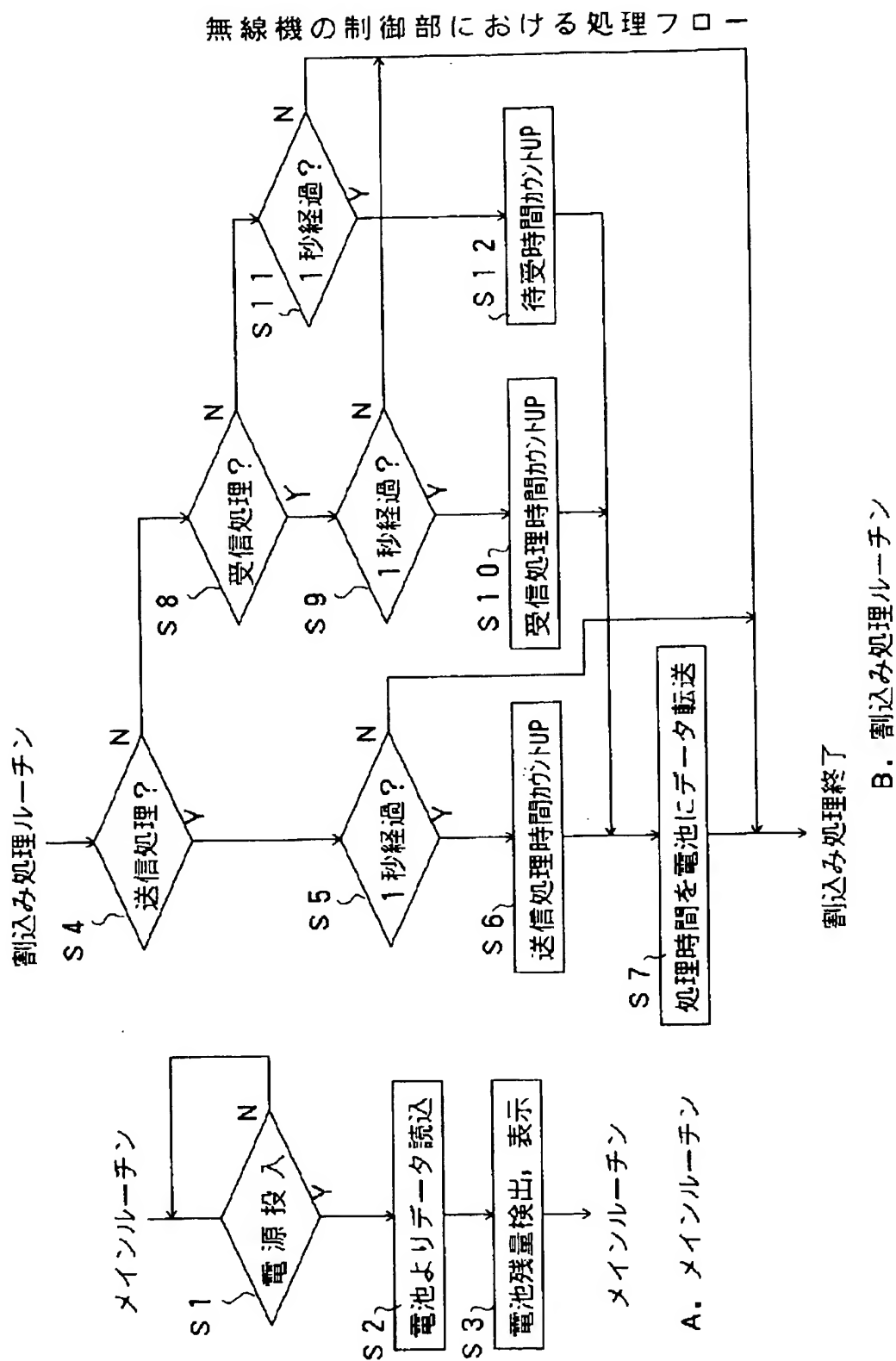


[Drawing 2]

## 実施例の構成図

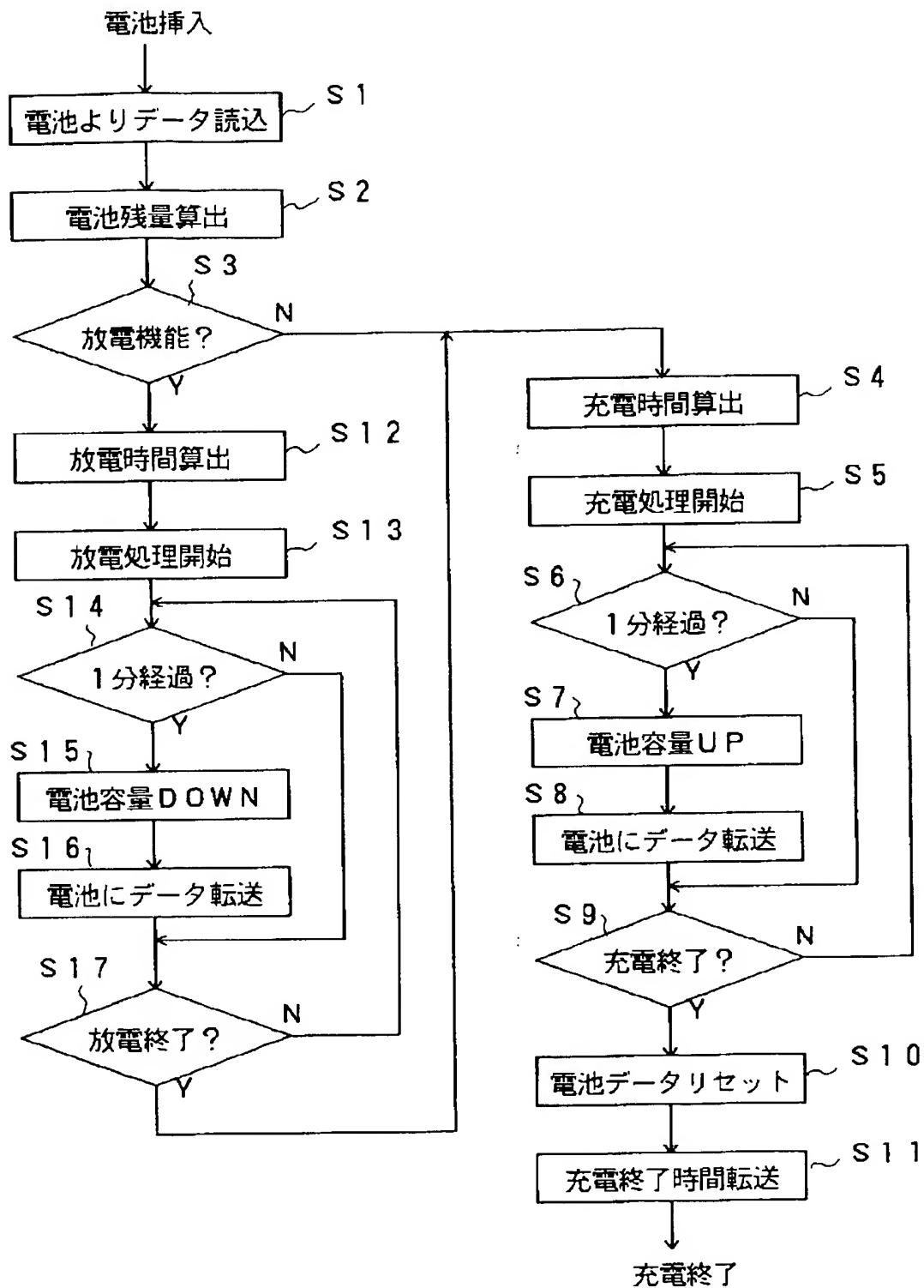


[Drawing 3]



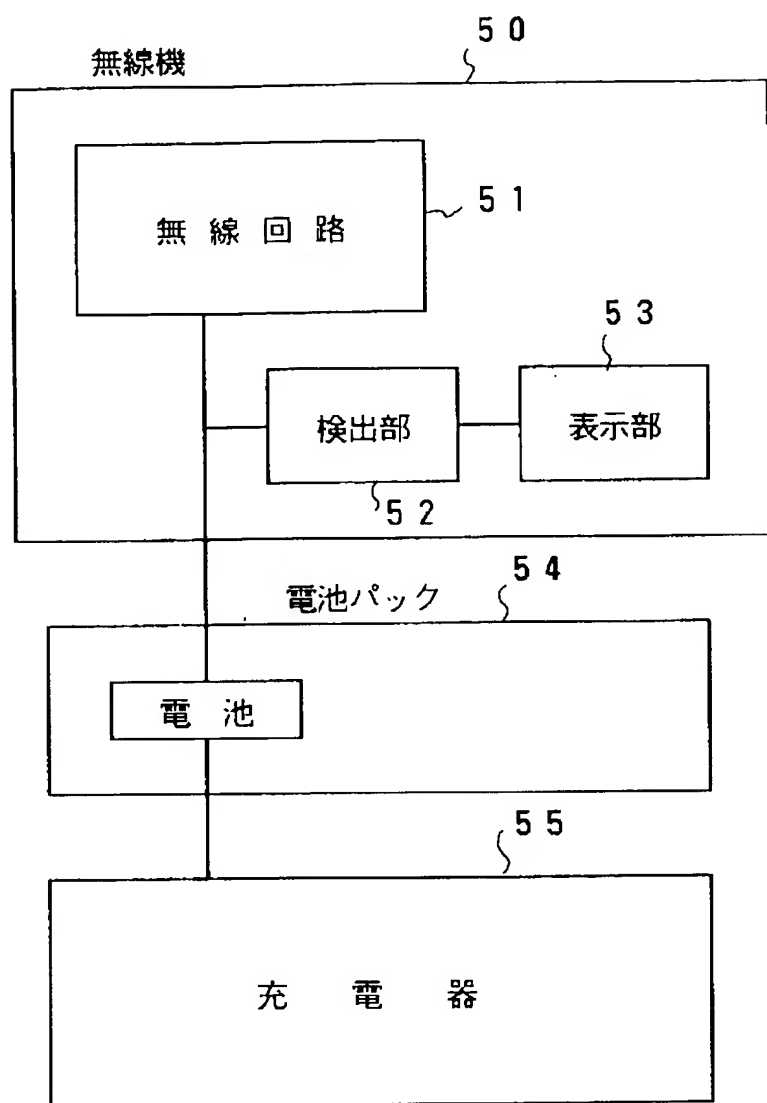
[Drawing 4]

## 充電器における処理フロー



[Drawing 5]

## 従 来 例 の 説 明 図



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